NON-PUBLIC?: N
ACCESSION #: 9006120016

LICENSEE EVENT REPORT (LER)

FACILITY NAME: Turkey Point Unit 3 PAGE: 1 OF 4

DOCKET NUMBER: 05000250

TITLE: Unit 4 Reactor Trip and Unit 3 Reactor Shutdown Required by Technical Specifications Due to Corrosion in Electrical Terminal Boxes for Main Steam Isolation Valves
EVENT DATE: 12/23/89 LER #: 89-020-01 REPORT DATE: 05/31/90

OTHER FACILITIES INVOLVED: Turkey Point Unit 4 DOCKET NO: 05000251

OPERATING MODE: 1 POWER LEVEL: 094

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(i) 50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: David R. Powell, Licensing TELEPHONE: (305) 246-6559
Superintendent

COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: EJ COMPONENT: BLK MANUFACTURER: G080
REPORTABLE NPRDS: Y

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

At 2314, on December 23, 1989, with Unit 4 in Mode 1 at 94 percent power, a reactor trip occurred due to closure of the 4A Main Steam Isolation Valve (MSIV). The sudden loss of steam flow from the 4A steam generator caused an increase in pressure in that steam generator. The pressure increase caused the steam generator level to "shrink" 'to the low-low level setpoint of 15 percent. The Auxiliary Feedwater System responded as designed. Corrosion across terminal board contacts supplying vital 125 VDC power to one of two 4A MSIV opening solenoid valves caused a fuse to blow. Upon de-energization, the opening solenoid failed to the vent position. This allowed air to bleed from the bottom of the MSIV piston. The MSIV disc dropped down into the steam flow, resulting in rapid closure of the MSIV. The accelerated corrosion rate

was due to stray DC leakage currents. Upon inspection of the terminal boards supplying vital 125 VDC power to the opening and closing solenoid valves for the 3A, 3B and 3C MSIVs, corrosion was identified on one of the two terminal boards for each the 3B and 3C MSIVs. The 3B and 3C MSIVs were declared inoperable and Unit 3 entered Technical Specification (TS) 3.0.1 at 2300 on December 24, 1989. The two terminal boards were replaced, the 3B and 3C MSIVs were declared operable, and Unit 3 exited TS 3.0.1 at 0455 on December 25, 1989.

END OF ABSTRACT

DESCRIPTION OF THE EVENT

Unit 4

At 2314, on December 23, 1989, with Unit 4 in Mode 1 (Power Operation) at 94 percent power, a reactor trip occurred due to closure of the 4A Main Steam Isolation Valve (MSIV) (EIIS:SB, Component:ISV). The sudden loss of steam flow from the 4A steam generator caused a pressure increase in that steam generator. The increased pressure resulted in "shrink" of the 4A steam generator level to the low-low level setpoint of 15 percent. The Auxiliary Feedwater System and one Code Safety Valve on the 4A steam generator responded as designed and the Unit was stabilized in Mode 3 (Hot Standby).

At 0013, on December 24, 1989, the NRC was notified of the Unit 4 reactor trip in accordance with 10CFR50.72(b)(2)(ii).

Instrument Air is provided to each MSIV through two solenoid valves for opening and maintaining the MSIV open and through two different solenoid valves for closing the MSIV. Vital 125 VDC power is supplied to the opening and closing solenoid valves. Train A power from one terminal box feeds one opening and one closing solenoid valve for a MSIV. Train B power from another terminal box feeds the other opening and closing solenoid valve for the same MSIV.

An investigation into the unexpected closure of the 4A MSIV revealed corrosion buildup between terminal board contacts in one of the two terminal boxes (EIIS: EJ, Component:
BX) providing 125 VDC vital power to
the MSIV opening and closing solenoid valves. The corrosion created a short circuit which, in turn, caused the fuse to an opening solenoid valve to blow. Upon loss of power, the de-energized solenoid valve failed to the vent position, allowing air to bleed from the bottom of the

MSIV air piston. The MSIV disc dropped down into the steam flow, resulting in rapid closure of the MSIV.

Unit 3

An inspection of the terminal boxes feeding vital 125 VDC power to the 3A, 3B and 3C MSIV opening and closing solenoid valves was conducted on December 24, 1989. Corrosion buildup was found on one terminal board (EIIS:EJ, Component: BLK) associated with the 3B MSIV and one terminal board associated with the 3C MSIV. Since the operability of the 3B and 3C MSIVs was in question, a decision was made to declare both MSIVs inoperable.

Technical Specification (TS) 3.8.1.b requires the MSIVs to be operable and capable of closing in 5 seconds or less. If an inoperable MSIV cannot be restored to an operable status within 48 hours, TS 3.8.3 requires the reactor to be shut down in accordance with TS 3.0.1. With more than one MSIV inoperable, TS 3.0.1 is entered at the time inoperability is declared. TS 3.0.1 requires that within one hour action shall be initiated to place the unit(s) in Mode 3 (Hot Standby) within the next six hours.

At 2300, on December 24, 1989, with Unit 3 operating at 100 percent power, the 3B and 3C MSIVs were declared inoperable. Unit 3 entered TS 3.0.1 and steps were taken to shut down the unit. Mode 2 (reactor critical with reactor power less than 5 percent) was achieved at approximately 0135 and repair work was initiated. At approximately 0455, on December 25, 1989, the two affected terminal boards had been replaced, the 3B and 3C MSIVs were declared operable, and Unit 3 exited TS 3.0.1.

At 2347, on December 24, 1989, the NRC was notified of the Unit 3 shutdown in accordance with 10CFR50.72(b)(1)(i)(A).

CAUSE OF THE EVENT

The root cause for the corroded terminal board was that it was installed in a service environment in which it was not compatible. The results of the analysis of both the terminal box water inleakage and the terminal board accelerated corrosion rate, which caused the blown fuse to an opening solenoid valve for the 4A MSIV, led to the following conclusions:

1. The accelerated corrosion rate experienced on the affected terminal board was due to stray DC leakage currents. This phenomenon is created when a terminal board is continuously energized in a humid

environment. This corrosion aggravated an acceptable but weak terminal board which caused a fault path through the terminal barrier between the positive and negative leads supplying a 4A MSIV opening solenoid valve.

2. Weep holes or lack of weep holes did not have an effect on the corrosion process. Terminal board corrosion under electrolytic conditions can occur as likely with or without weep holes.

ANALYSIS OF THE EVENT

The MSIVs are 26 inch air operated isolation valves. These full flow valves are held open against spring pressure by air from the plant Instrument Air System. The air pressure must overcome the weight of the valve disc and spring tension to hold the valve open. The MSIV disc opens into the steam flow such that steam flow acts to close and seat the valve.

Loss of vital 125 VDC power to an opening solenoid valve caused it to fail in the vent position. This allowed air to bleed from the bottom of the MSIV piston. The MSIV disc dropped into the steam flow, resulting in rapid closure of the MSIV. The sudden loss of steam flow from the 4A steam generator caused an increase in pressure in that steam generator. The pressure increase resulted in "shrink" of steam generator level to the low-low level setpoint of 15 percent. The Auxiliary Feedwater System and one Code Safety Valve on the 4A steam generator responded as designed and the Unit was stabilized in Mode 3 (Hot Standby). The health and safety of the public were not affected by this event.

CORRECTIVE ACTIONS

1. FPL engineering design procedures (Quality Instructions) will be evaluated and strengthened where appropriate to reduce the probability of corrosion problems associated with electrical component applications in the future. This action will be completed by August 15, 1990.

2. Terminal boards in each of the two terminal boxes supplying vital 125 VDC power to the opening and closing solenoid valves for the Unit 3 and Unit 4 MSIVs have been replaced with Raychem splices. Weep holes were added to these terminal boxes to prevent potential water accumulation.

3. Walkdowns of plant areas outside the containment buildings have been

performed to inspect terminal boxes in areas subject to potential moisture intrusion.

4. Other terminal boards have been identified as being susceptible to stray DC current leakage corrosion. These terminal boards are being inspected on a periodic basis. Replacement of the terminal boards with Raychem splices or application of a moisture resistant chemical coating to the terminal boards will be performed, if required, to relax the periodic inspection requirements.

5. Terminal boxes have been identified for which weep holes are desirable. Weep holes will be drilled in these terminal boxes by August 15, 1990.

6. Procedures are being revised, as necessary, to improve the inspection and installation of terminal boxes. This action will be completed by July 27, 1990.

ADDITIONAL INFORMATION

The terminal boards are General Electric Co. Model EB25.

No similar Licensee Event Reports have been issued for Turkey Point Units 3 or 4.

ATTACHMENT 1 TO 9006120016 PAGE 1 OF 1

P. O. Box 14000, Juno Beach, FL 33408-0420
FPL

MAY 31 1990
L-90-200
10 CFR 50.73

U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Units 3 and 4
Dockets No. 50-250 and 50-251
Reportable Event: 89-020 Revision 1
Date of EVent: December 23, 1989
Unit 4 Reactor Trip and Unit 3 Reactor Shutdown Required by Technical Specifications Due to Corrosion in Electrical Terminal

Boxes for Main Steam Isolation Valves

The attached licensee Event Report is being submitted pursuant to the requirements of 10 CFR 50.73 to provide supplemental information on the subject event.

Very truly yours,

K. N. Harris
Vice President
Turkey Point Plant Nuclear

KNH/DRP/DWH/rat

attachment

cc: Stewart E. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

an FPL Group company

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